CLAIMS

1. A radiator element comprising:

a pair of fin-shaped substrates spaced apart from one another, each having a transition section and a feed surface;

a balanced symmetrical feed having a pair of radio frequency (RF) feed lines disposed adjacent to and electromagnetically coupled to a corresponding one of the feed surfaces; and

wherein the pair of radio frequency feed lines forms a signal null point adjacent the transition sections.

2. The radiator element of Claim 1 wherein:

the balanced symmetrical feed further comprises a housing having a plurality of sidewalls forming a cavity; and

the pair of feed lines are each disposed on a corresponding one of the sidewalls and comprise a microstrip transmission line.

3. The radiator element of Claim 1 wherein the pair of fin-shaped substrates are disposed to form a tapered slot.

4. The radiator element of Claim 1 wherein the balanced symmetrical feed is a raised balanced symmetrical feed.

5. The radiator element of Claim 1 wherein a first one of the pair of radio frequency feed lines is adapted for receiving a radio frequency signal and a second of one the pair of radio frequency feed lines is adapted for receiving a radio frequency signal phase shifted by approximately 180 degrees.

6. The radiator element of Claim 1 wherein the pair of substrates are provided from an electrically conductive material.

7. The radiator element of Claim 6 wherein the pair of substrates comprise copper plated metal.

8. The radiator element of Claim 1 wherein the pair of substrates comprise a metalized substrate.

9. The radiator element of Claim 1 wherein each of the substrates has a height of less than approximately $0.25\lambda_L$, where λ_L refers to the wavelength of the low end of a range of operating wavelengths.

10. The radiator element of Claim 1 further comprising:

a second pair of substrates spaced apart from one another each having a transition section forming a second tapered slot and having a second feed surface wherein the second pair of substrates form a plane which is substantially orthogonal to a plane formed by the first pair of substrates;

wherein the balanced symmetrical feed includes a second pair of radio frequency feed lines each disposed adjacent to and electromagnetically coupled to the feed surface of one of the second pair of transitions; and

wherein the second pair of radio frequency feed lines are electromagnetically coupled to the second feed surfaces adjacent the signal null point.

11. The radiator element of Claim 1 wherein each of the feed surfaces has a first portion in a first plane and a second portion in a second plane, wherein the first plane forms an angle of from about 91 degrees to about 180 with the second plane.

12. The radiator element of Claim 1 wherein the balanced symmetrical feed further comprises:

a cavity having a plurality of sidewall surfaces and a top surface disposed adjacent the pair of radio frequency feed lines; and

a pair of transmission feed lines, each disposed adjacent to an opposing

corresponding sidewall surface of said cavity and having a first feed end electromagnetically coupled to a corresponding one of the pair of radio frequency feed lines.

13. The radiator element of Claim 12 wherein each of the pair of transmission feed lines further comprise a second feed end; and

the radiator element further comprises a balun having a pair of outputs each coupled to a corresponding one of the second feed ends of the pair of transmission feed lines.

14. The radiator element of Claim 13 further comprising a pair of amplifiers each coupled between a corresponding balun output and second feed end of one of the pair of transmission feed lines.

15. A wideband antenna comprising:

a cavity plate having a first surface and a second opposing surface;

a first plurality of fins disposed on the first surface of the cavity plate spaced apart from one another forming a first plurality of tapered slots having a feed surface;

a second plurality of fins disposed on the first surface of the cavity plate spaced apart from one another forming a second plurality of tapered slots, each substantially orthogonal to a corresponding one of the first plurality of tapered slots and having a feed surface; and

a plurality of balanced symmetrical feed circuits disposed on the first surface, each having a pair of radio frequency (RF) feed lines electromagnetically coupled to corresponding ones of the feed surfaces.

16. The wideband antenna of Claim 15 wherein the cavity plate further comprises a plurality of apertures; and

wherein each of the plurality of balanced symmetrical feed circuits is disposed in a corresponding one of the plurality of apertures.

17. The wideband antenna of Claim 17 further comprising a connector plate disposed adjacent the second surface of the cavity plate and having a plurality of connections;

and wherein each of the plurality of balanced symmetrical feed circuits has a plurality of feed connections each coupled to a corresponding one of the plurality of connector plate connections.

18. The antenna of Claim 15 wherein each of the fins has a height of less than about approximately $0.25\lambda_L$, where λ_L refers to the wavelength of the low end of a range of operating wavelengths.

19. The antenna of Claim 15 wherein each of the plurality of balanced symmetrical feed circuits is a raised feed circuit having a shape which conforms to the feed surfaces of a corresponding one of the plurality of fins.

20. The antenna of Claim 15 further comprising a plurality of baluns each coupled to a corresponding RF feed line.

21. The antenna of Claim 20 further comprising a plurality of RF connectors each coupled to a corresponding one of the plurality of baluns.

22. A method for converting the propagation mode of a waveform from a TEM mode to a Floquet mode in a notched radiator element, the method comprising:

providing a pair of elements;

providing a balanced symmetrical feed circuit having a pair of radio frequency feed lines;

coupling the pair of radio frequency feed lines to the elements;

feeding the elements with a differential RF signal coupled to each of the pair of radio frequency feed lines.

23. The method of Claim 22 wherein each of the pair of elements comprises a pair of

substrates each having a transition section and a feed surface and wherein the transition sections form a tapered notch.

24. The method of Claim 23 wherein each of the substrates has a height of less than approximately $0.25\lambda_L$, where λ_L corresponds to the wavelength of the low end of a range of operating wavelengths.